CLAIMS

1. A radioactive substance container comprising a thick bottomed container in which a bottom section and a body section are formed integrally by hot-dilating a metal billet in a container for forming.

2. A radioactive substance container comprising a thick bottomed container in which when a metal billet is hot-dilated in a container for forming and its body section is worked, a boring uncompleted section remains on one end side of the body section so as to be a bottom section and the bottom section and the body section are formed integrally.

3. The radioactive substance container according to claim 1 or 2, wherein a section of the metal billet vertical to an axial direction is polygonal and a shape in a section of the container for forming vertical to an axial direction is circular.

4. The radioactive substance container according to claim 1 or 2, wherein a section of the metal billet vertical to an axial direction is polygonal and a section of the container for forming vertical to an axial direction is polygonal.

5. A radioactive substance container comprising a bottomed container for storing a basket for used nuclear fuel aggregate in which a bottom section and a body section is integral by hot dilation forming in a container for forming.

6. The radioactive substance container according to any one of claims 1 to 5, wherein a section of the boring punch has a dimension and a shape which approach to the section of the basket for used nuclear fuel aggregate.

7. A radioactive substance container comprising a bottomed container, in which a dosage equivalent factor of γ rays on an outer wall surface of a substantially center portion of a side surface of the body is not more than 200 μSv/h in the case where radioactive substance is contained in a bottomed container in which its bottom section and body section are formed integrally by hot dilation forming in a container for forming.

8. The radioactive substance container according to any one of claims 1 to 3, wherein an outer diameter of the bottomed container is not less than 1000 mm to not more than 3000 mm and its thickness is not less than 150 mm to not more than 300 mm.

9. A radioactive substance container comprising a bottomed container where a metal billet, in which at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape, is set into a container for forming and a boring punch is pushed into the metal billet and the metal billet is hot-dilated so that a bottom section and a body section are formed integrally.

10. A radioactive substance container comprising:

a bottomed container where a bottom section and a body section are formed integrally by hot press pressure and γ rays generated from radioactive substance such as used fuel is shielded;

a neutron shielding member which is provided around the bottomed container and shields neutron generated from the radioactive substance; and

a cover for covering an opening of the bottomed container.

11. A radioactive substance container comprising:

a bottomed container which contains a radioactive substance such as used fuel into a body section with a bottom section and shields γ rays generated from the radioactive substance;

a neutron shielding material which is arranged around

the bottomed container and shields neutron generated from the radioactive substance,

wherein a metal billet is heated and is upset and drawn so that the bottom section and the body section are formed integrally.

12. The radioactive substance container according to any one of claims 1 to 11, wherein a spot facing section is further formed integrally with the bottom section at the time of forming the bottomed container.

13. The radioactive substance container according to any one of claims 1 to 12, wherein a flange is further provided integrally with the body section of the bottomed container.

14. The radioactive substance container according to any one of claims 1 to 13, wherein at least any one of an external section and an internal section of the bottomed container vertical to the axial direction is polygonal.

15. A hot dilation forming-use metal billet, wherein at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape.

16. A hot dilation forming-use metal billet, wherein at least one plane is provided on at least any one of a side surface on a pressing forward side and a side surface on a pressing backward side.

17. The hot dilation forming-use metal billet according to claim 15 or 16, wherein a taper which becomes thinner towards the pressing direction is provided on the pressing forward side of the metal billet.

18. The hot dilation forming-use metal billet according to claim 15 or 16, wherein at least one or more stepped sections are provided so that the pressing forward side of the metal billet becomes thinner gradationally towards the pressing direction.

19. A hot dilation forming-use metal billet, wherein at least one plane is provided on a side surface and an extended section which engages with an end portion of an inlet of a container for forming is provided on an end portion on a pressing backward side.

20. A hot dilation forming-use metal billet, wherein at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape, and an extended

section which engages with an end portion of an inlet of a container for forming is provided on a pressing backward side.

21. A hot dilation forming-use metal billet, wherein at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape, and at least one or more stepped sections are provided so that the pressing forward side becomes thinner gradationally towards a pressing direction, and an extended section which engages with an end portion of an inlet of a container for forming is provided on a pressing backward side.

22. A hot dilation forming-use metal billet, wherein at least one plane is provided on at least any one of a side surface on a pressing forward side and a side surface on a pressing backward side, and at least one or more stepped sections are provided so that the pressing forward side becomes thinner gradationally towards the pressing direction, and an extended section which engages with an end portion of an inlet of a container for forming is provided on the pressing backward side.

23. A container, wherein a metal billet is hot-dilated in a container for forming, and a bottom section and body section are formed integrally and a thick bottomed container is obtained.

24. A container, wherein when a metal billet is hot-dilated in a container for forming and a body section is worked, a boring uncompleted section is allowed to remain on one end side of the body section so as to be a bottom section, and an integrally thick bottomed container is obtained.

25. The container according to claim 23 or 24, wherein a section of the metal billet vertical to an axial direction is polygonal and an internal shape of a section of the container for forming vertical to the axial direction is circular.

26. The radioactive substance container according to claim 23 or 24, wherein a section of the metal billet vertical to an axial direction is polygonal and an internal shape of a section of the container for forming vertical to the axial direction is polygonal.

27. The container according to any one of claims 23 to 26, wherein an outer diameter of the bottomed container is not less than 200 mm to not more than 4000 mm, and a thickness is not less than 20 mm to not more than 400 mm.

28. A container, wherein a metal billet, where at least a section vertical to an axial direction on a pressing forward side is polygonal, is set into a container for forming, and a boring punch is pushed into the metal billet and the metal billet is hot-dilated to be formed into a bottomed container where a bottom section and a body section are integral.

29. The container according to any one of claims 23 to 28, wherein the bottomed container is constituted so that at least any one of an external section and an internal section of the bottomed container vertical to the axial direction is polygonal.

30. A bottomed container manufacturing apparatus comprising:

a container for forming having at least a container body section and a container bottom section in which the container body section and the container bottom section can move relatively with respect to an axial direction of the container body section; and

a boring punch which is mounted to a pressing machine and pressurizes a metal billet for hot dilation forming set into the container for forming.

31. A bottomed container manufacturing apparatus comprising:

a container for forming having at least container body sections and container bottom sections divided in an axial direction in which the container body section and the container bottom section can move relatively with respect to an axial direction of the container body section; and

a boring punch which is mounted to a pressing machine and pressurizes a metal billet for hot dilation forming set into the container for forming.

32. A radioactive substance container manufacturing method comprising:

the step of rounding a drum-shaped bottomed container where a bottom section and a body section are formed integrally by hot dilation and setting a tool so as to cut an external side of the bottomed container; and

the step of cutting an internal section of the bottomed container into a shape according to at least one portion of an outer peripheral shape of a basket for containing used nuclear fuel aggregate.

33. A radioactive substance container manufacturing method comprising:

the step of hot-dilating a bottomed container so that its bottom section and body section are integral; and

the step of cutting an internal section of the bottomed container into a shape according to at least one portion of an outer peripheral shape of a basket for containing used nuclear fuel aggregate.

34. A container manufacturing method comprising:

the step of setting a metal billet having at least one plane on a side surface into a container for forming with a gap from an inner wall; and

the step of pushing a boring punch into the metal billet and bending the plane towards the inner wall so as to hot-dilate the metal billet.

35. A container manufacturing method comprising:

the step of setting a metal billet, which has at least one plane on a side surface and an extended section engaging with an end portion of an inlet of a container for forming on an end portion of a pressing backward side, into the container for forming with a gap from an inner wall; and

the step of pushing a boring punch into the metal billet and bending the plane towards the inner wall so as to

hot-dilate the metal billet.

36. A container manufacturing method comprising:

the step of setting a metal billet, where at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape, into a container for forming; and

the step of pushing a boring punch into the metal billet and hot-dilating the metal billet.

37. A container manufacturing method, wherein a metal billet having at least one plane on at least any one of a side surface on a pressing forward side and a side surface on a pressing backward side is set into a container for forming, and a boring punch is pushed into the metal billet and the metal billet is hot-dilated.

38. A hot pressing method, of manufacturing a thick metal-made drum or a cylindrical container having an excellent shape of an end surface, wherein a metal billet having different diameter sections without joint, where its pressing forward side is composed of a member having a section with an outer diameter smaller than an inner diameter of a container or an outer diameter of a diagonal length or a member having a section with an outer diameter of a diagonal

length equal with the inner diameter of the container and its backward side is composed of a member having a section with an outer diameter or a diagonal length equal with the inner diameter of the container, is set into the container for press forming which was heated to a press working temperature, and while a center of a workpiece of the metal billet without joint is being bored by a punch, the metal billet is press-worked.

39. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine comprising:

the step of setting the metal billet, where its pressing forward side has a section having an outer diameter with a diagonal length of not more than an inner diameter of the container and its backward side has a section having an outer diameter substantially equal with the inner diameter of the container, into a container for press forming which was heated to a press working temperature; and

the step of boring a center of a workpiece of the metal billet by means of the boring punch and simultaneously press-working the metal billet.

40. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine, the method comprising:

the step of setting the metal billet, where its pressing forward side has a section having an outer diameter with a diagonal length of smaller than an inner diameter of the container and its backward side has a section having a diagonal length substantially equal with the inner diameter of the container, into a container for press forming which was heated to a press working temperature; and

the step of boring a center of a workpiece of the metal billet by means of the punch and simultaneously press-working the metal billet.

41. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine, the method comprising:

the step of setting the metal billet, where its pressing forward side has a section with an outer diameter smaller than an inner diameter of the container and its backward side has a section with an outer diameter substantially equal with the inner diameter of the container, into a container for press forming which was heated to a press working

temperature; and

the step of boring a center of a workpiece of the metal billet by means of the punch and simultaneously press-working the metal billet.

42. A method of manufacturing a container, comprising:

the step of setting a metal billet having at least one plane on a side surface into a container for forming with a gap from an inner wall;

the step of pushing the metal billet so as to extend a pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of pushing a boring punch into the metal billet and bending the plane towards the inner wall so as to hot-dilate the metal billet.

43. A method of manufacturing a container, comprising:

the step of setting a metal billet, where at least one plane is provided on a side surface and an extended section engaging with an end portion of an inlet of a container for forming is provided on a pressing backward side, into a container for forming with a gap from an inner wall; and

the step of pushing a boring punch into the metal billet and bending the plane towards the inner wall so as to hot-dilate the metal billet.

44. A method of manufacturing a container, comprising:

the step of setting a metal billet, where at least a section vertical to an axial direction on a pressing forward side is formed into a polygonal shape, into a container for forming;

the step of pushing the metal billet so as to extend a pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of pushing a boring punch into the metal billet so as to hot-dilate the metal billet.

45. A method of manufacturing a container, comprising:

the step of setting a metal billet, where at least one plane is provided on at least any one of a side surface of a pressing forward side and a side surface of a pressing backward side, into a container for forming;

the step of pushing the metal billet so as to extend a pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of pushing a boring punch into the metal billet so as to hot-dilate the metal billet.

46. A method of hot pressing a thick metal-made cylinder or a cylindrical container having an excellent shape of an end surface, wherein a metal billet having different diameter

sections without joint, where its pressing forward side is composed of a member having a section with an outer diameter smaller than an inner diameter of a container or an outer diameter of a diagonal length or a member having a section with an outer diameter of a diagonal length equal with the inner diameter of the container and its backward side is composed of a member having a section with an outer diameter or a diagonal length equal with the inner diameter of the container, is set into the container for press forming which was heated to a press working temperature, and the metal billet is pushed so that the pressing backward side of the metal billet is extended to an end portion of an inlet of the container for forming, and while a center of a workpiece of the metal billet without joint is being bored by a punch, the metal billet is press-worked.

47. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine, the method comprising:

the step of setting the metal billet, where its pressing forward side has a section having an outer diameter with a diagonal length of not more than an inner diameter of the container and its backward side has a section having an outer diameter substantially equal with the inner diameter of the

container, into a container for press forming which was heated to a press working temperature;

the step of pushing the metal billet so as to extend the pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of boring a center of a workpiece of the metal billet by means of the boring punch and simultaneously press-working the metal billet.

48. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine, the method comprising:

the step of setting the metal billet, where its pressing forward side has a section having an outer diameter with a diagonal length of smaller than an inner diameter of the container and its backward side has a section having a diagonal length substantially equal with the inner diameter of the container, into a container for press forming which was heated to a press working temperature;

the step of pushing the metal billet so as to extend the pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of boring a center of a workpiece of the metal billet by means of the punch and simultaneously

press-working the metal billet.

49. A method of manufacturing a drum or a container of setting a metal billet into a container for forming and hot-dilating the metal billet by means of a boring punch to be operated by a pressing machine, the method comprising:

the step of setting the metal billet, where its pressing forward side has a section with an outer diameter smaller than an inner diameter of the container and its backward side has a section with an outer diameter substantially equal with the inner diameter of the container, into a container for press forming which was heated to a press working temperature;

the step of pushing the metal billet so as to extend the pressing backward side of the metal billet to an end portion of an inlet of the container for forming; and

the step of boring a center of a workpiece of the metal billet by means of the punch and simultaneously press-working the metal billet.

50. The method of manufacturing a container according to any one of claims 34 to 49 further comprising the step of forming the metal billet by means of a forging step and forming at least the pressing forward side of the metal billet into an angular section.

51. The method of manufacturing a container according to claim 50, wherein the forging step includes the step of providing a taper which becomes thinner towards the pressing direction on the pressing forward side of the metal billet.

52. The method of manufacturing a container according to claim 50, wherein the forging step includes the step of providing at least one stepped section so that the pressing forward side of the metal billet becomes thinner gradationally towards the pressing direction.

53. The method of manufacturing a container according to any one of claims 34 to 52, further comprising:

the step of providing a drum-shaped member between the metal billet and the bottom of the container for forming and setting the metal billet into the container for forming;

the step of pushing the boring punch into the metal billet and hot-dilating the metal billet so as to form the bottomed container where the bottom section and the body section are integral;

the step of removing the drum-shaped member from the bottom section of the bottomed container after the forming; and

the step of removing a pillar-shaped portion formed on the bottom section of the bottomed container by means

of the drum-shaped member.

54. The method of manufacturing a container according to any one of claims 34 to 52, further comprising:

the step of providing a pillar-shaped member between the metal billet and the bottom of the container for forming and setting the metal billet into the container for forming;

the step of pushing the boring punch into the metal billet and hot-dilating the metal billet so as to form the bottomed container where the bottom section and the body section are integral; and

the step of removing the pillar-shaped member from the bottom section of the bottomed container after the forming.

55. The method of manufacturing a container according to any one of claims 34 to 54, wherein the body section of the container for forming can move relatively with respect to the bottom section of the container for forming.

56. The method of manufacturing a container according to claim 55, wherein the body section of the container for forming is divided in an axial direction.

57. A method of manufacturing a container comprising:

the upsetting step of placing a pressurizing platform into a ring-shaped die formed with an opening at its inner end portion and putting a metal billet into a mold composed of the die and the pressurizing platform so as to pressurize the metal billet by means of a boring punch; and

the metal billet drawing step of supporting the die by means of a drum-shaped spacer and pushing the metal billet by means of the boring punch.

58. A method of manufacturing a container comprising:

the upsetting preparation step of stacking a plurality of ring-shaped dies formed with an opening on its inner end portion and stacking a plurality of pressurizing platforms respectively in the dies and putting a metal billet into a mold composed of the die and the pressurizing platform;

the upsetting step of pressurizing the metal billet from above the mold using a boring punch to be operated by a pressing machine;

the receding step of allowing the boring punch and the whole metal billet including and the upper die to recede;

the drawing preparation step of removing the used pressurizing platform and placing a drum-shaped spacer onto the next die and placing the receded whole metal billet including the die onto the spacer;

the drawing step of pushing the metal billet by means of the boring punch and drawing the metal billet by means of the die; and

the repeating step of repeating the above-mentioned steps on the next pressurizing platform and die using a spacer of a length according to deformation of the metal billet.